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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER

LEUNG, CHRISTINA Y

ART UNIT	PAPER NUMBER
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2633

DATE MAILED: 08/12/2004

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/822,466

Applicant(s)

OOI ET AL.

Examiner

Christina Y. Leung

Art Unit

2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-9, 13-16 and 19-21 is/are rejected.
- 7) ☒ Claim(s) 5, 6, 10-12 and 17-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claim 19 is objected to because of the following informalities:

Claim 19 recites "said first ground" in line 4 of the claim. Examiner respectfully suggests that Applicants should change this phrase to "said first group." Claim 19 also recites "said variable dispersion compensators" (sic) in line 4 of the claim. Applicants should change the word "compensators" to "compensator" since only one compensator is provided in claim 13 on which the claim depends.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3, 4, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Danziger et al. (US 2002/006257 A1).

Regarding claim 1, Danziger et al. disclose a method (Figure 3a) comprising:

generating WDM signal light by wavelength division multiplexing a plurality of optical signals having different wavelengths (within transmitter 20; page 2, paragraph [0039]);

transmitting the WDM signal light by an optical fiber transmission line (i.e., through fiber 30); and

receiving the WDM signal light transmitted by the optical fiber transmission line;
the receiving comprising:

detecting chromatic dispersion related to at least one of the plurality of optical signals
(using dispersion measuring device 130, located at the receiving end of the system; page 3,
paragraphs [0043]-[0046]; and

providing a variable dispersion compensator (dispersion compensating device 50, one of
which is located at the receiving end of the system) whose chromatic dispersion and dispersion
slope are controlled so that the detected chromatic dispersion is reduced (page 2, paragraphs
[0040] and [0041]; page 3, paragraph [0046]); pages 4 and 5, paragraphs [0061]-[0070]).

Danziger et al. disclose that the dispersion compensating devices 50 are variable and
controlled, and further disclose that they compensate both dispersion and dispersion slope (page
2, paragraphs [0040] and [0041]).

Regarding claim 3, Danziger et al. further disclose that the transmitting comprises
providing a linear repeating unit (such as repeater 40 in Figure 3a).

Regarding claim 4, Danziger et al. disclose that the transmitting further comprises:

detecting chromatic dispersion related to at least one of the plurality of optical signals in
the linear repeating unit (Figure 6 shows dispersion measuring devices 130 at a linear repeating
unit 40; page 5, paragraph [0080]); and

providing a variable dispersion compensator 50 whose chromatic dispersion and
dispersion slope are controlled so that the detected chromatic dispersion in the linear repeating
unit is reduced (again, Figure 6 shows that the compensator 50 may be located at a repeating unit
40).

Again, Danziger et al. disclose that the dispersion compensating devices 50 compensate both dispersion and dispersion slope (page 2, paragraphs [0040] and [0041]).

Regarding claim 13, as similarly discussed above with regard to claim 1, Danziger et al. disclose a system (Figure 3a) comprising:

- a transmitting terminal unit 20 for generating WDM signal light by wavelength division multiplexing a plurality of optical signals having different wavelengths (page 2, paragraph [0039]);

- an optical fiber transmission line 30 for transmitting the WDM signal light; and

- a receiving terminal unit (including receiver 60) for receiving the WDM signal light transmitted by the optical fiber transmission line;

- the receiving terminal unit comprising: a dispersion monitor 130 for detecting chromatic dispersion related to at least one of the plurality of optical signals (page 3, paragraphs [0043]-[0046]);

- a variable dispersion compensator 50 (Figure 3a shows one such element located at the receiving end of the system); and

- a circuit (controller 140) for controlling the chromatic dispersion and dispersion slope in the variable dispersion compensator so that the detected chromatic dispersion is reduced (page 3, paragraph [0046]; pages 4 and 5, paragraphs [0061]-[0070]).

Again, Danziger et al. disclose that the dispersion compensating devices 50 compensate both dispersion and dispersion slope (page 2, paragraphs [0040] and [0041]).

Art Unit: 2633

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7, 9, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US 5,602,666 A) in view of Abbott et al. (US 6,567,577 B2).

Regarding claim 7, Ishikawa et al. disclose a method (Figures 28-36 and 41-43) comprising:

generating WDM signal light by wavelength division multiplexing a plurality of optical signals having different wavelengths (using transmitters 21a and multiplexer 21b; column 34, lines 60-66);

transmitting the WDM signal light by an optical fiber transmission line (column 35, lines 7-11); and

receiving the WDM signal light transmitted by the optical fiber transmission line (using receiver 23; column 35, lines 12-18);

the receiving step comprising the steps of:

detecting chromatic dispersion related to at least one of the plurality of optical signals (Figure 43; column 35, lines 47-51; column 42, lines 16-47);

providing a variable dispersion compensator whose chromatic dispersion is controlled so that the detected chromatic dispersion is reduced (compensators 25A and 25B in Figure 36 in

particular are located at the receiver; Figures 41-43 show how the dispersion compensator element may be variable; column 41, lines 26-29; column 42, lines 16-47).

Ishikawa et al. do not specifically disclose providing a separate dispersion slope compensator for compensating dispersion slope at the receiver.

However, Abbott et al. teach a method related to the one disclosed by Ishikawa et al. including compensating dispersion in a WDM transmission system (Figures 1 and 2; column 3, lines 1-18). Abbott et al. further teach a dispersion compensating device 105 (shown in detail in Figure 2) that compensates for dispersion slope (column 4, lines 1-55) and further teach that the dispersion slope compensator elements may be provided in conjunction with a chromatic dispersion compensator 202 (column 4, lines 34-37).

Ishikawa et al. already generally disclose that different compensating devices may be used for different wavelengths in a WDM system (Figures 28-33). It would have been obvious to a person of ordinary skill in the art to provide a slope compensator device as taught by Abbott et al. in combination with the variable dispersion compensator in the method already disclosed by Ishikawa et al. in order to fully compensate the dispersion in the system in all the wavelengths transmitted in the system.

Regarding claim 9, Ishikawa et al. further disclose that the transmitting comprises providing a linear repeating unit (repeaters 22 in Figures 28-36).

Regarding claim 15, as similarly discussed above with regard to claim 7, Ishikawa et al. disclose a system (Figures 28-36 and 41-43) comprising:

a transmitting terminal unit (including transmitters 21a and multiplexer 21b) for generating WDM signal light by wavelength division multiplexing a plurality of optical signals having different wavelengths (column 34, lines 60-66);

an optical fiber transmission line for transmitting the WDM signal light (column 35, lines 7-11); and

a receiving terminal unit 23 for receiving the WDM signal light transmitted by the optical fiber transmission line (column 35, lines 12-18);

the receiving terminal unit comprising:

a dispersion monitor for detecting chromatic dispersion related to at least one of the plurality of optical signals (Figure 43; column 35, lines 47-51; column 42, lines 16-47);

a variable dispersion compensator (compensators 25A and 25B in Figure 36 in particular are located at the receiver; Figures 41-43 show how the dispersion compensator element may be variable; column 41, lines 26-29; column 42, lines 16-47); and

a circuit for controlling the chromatic dispersion in the variable dispersion compensator so that the detected chromatic dispersion is reduced (Figures 42-43).

Ishikawa et al. do not specifically further disclose a separate dispersion slope compensator for compensating dispersion slope at the receiver.

However, Abbott et al. teach a method related to the one disclosed by Ishikawa et al. including compensating dispersion in a WDM transmission system (Figures 1 and 2; column 3, lines 1-18). Abbott et al. further teach a dispersion compensating device 105 (shown in detail in Figure 2) that compensates for dispersion slope (column 4, lines 1-55) and further teach that the

dispersion slope compensator elements may be provided in conjunction with a chromatic dispersion compensator 202 (column 4, lines 34-37).

Ishikawa et al. already generally disclose that different compensating devices may be used for different wavelengths in a WDM system (Figures 28-33). It would have been obvious to a person of ordinary skill in the art to provide a slope compensator device as taught by Abbott et al. in combination with the variable dispersion compensator in the system already disclosed by Ishikawa et al. in order to fully compensate the dispersion in the system in all the wavelengths transmitted in the system.

6. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Danziger et al. in view of Ishikawa et al.

Regarding claim 19, Danziger et al. disclose a system as discussed above with regard to claim 13 including a variable dispersion compensator at the receiving terminal unit and a circuit for controlling the compensator. Danziger et al. do not specifically disclose that the receiving terminal unit further comprises an interleaver for dividing the WDM signal into first group of optical signals and second group of optical signals or that the variable dispersion compensator is provided for the first and second groups of signals.

However, Ishikawa et al. teach a system related to the one disclosed by Danziger et al. including dispersion compensators in a WDM system (Figure 33). Ishikawa et al. further teach an interleaver 23c and dispersion compensators 25 provided for first and second groups of signals located in a receiving terminal unit 23 (column 36, lines 37-60; column 37, lines 53-65).

It would have been obvious to a person of ordinary skill in the art to arrange the variable dispersion compensators disclosed by Danziger et al. in the way taught by Ishikawa et al. using

an interleaver in order to provide different compensation for different wavelengths in the WDM system. One in the art would have been particularly motivated to use an interleaver as taught by Ishikawa et al. with the system disclosed by Danziger et al. in order to allow more flexibility in providing optimal dispersion compensation amounts specific to certain wavelengths (Ishikawa et al., column 37, lines 19-29).

Regarding claim 20, Danziger et al. disclose a system as discussed above with regard to claim 13 including a transmitting terminal unit. They do not specifically disclose that the transmitting terminal unit includes an interleaver and first and second variable dispersion compensators.

However, Ishikawa et al. teach a system related to the one disclosed by Danziger et al. including dispersion compensators in a WDM system (Figure 31). Ishikawa et al. further teach an interleaver (comprising elements 21c and 21d) of dividing the plurality of optical signals into two groups, and first and second dispersion compensators 25 for compensating chromatic dispersion in each group. Ishikawa et al. further teach that the dispersion compensators may be variable (column 37, lines 25-29; column 41, lines 26-29; column 42, lines 16-47).

It would have been obvious to a person of ordinary skill in the art to including an interleaver and additional variable dispersion compensators as taught by Ishikawa et al. in the system disclosed by Danziger et al. in order to provide additional dispersion compensation in the system. One in the art would have been particularly motivated to use an interleaver and compensators as taught by Ishikawa et al. with the system disclosed by Danziger et al. in order to allow more flexibility in providing optimal dispersion compensation amounts specific to certain wavelengths (Ishikawa et al., column 37, lines 19-29).

7. Claims 2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Danziger et al. in view of Ihara et al. (US 5,999,289 A).

Regarding claims 2 and 14, Danziger et al. disclose a method and system as discussed above with regard to claims 1 and 13, including steps and means for detecting dispersion. They do not specifically disclose that the detecting comprises the steps specifically recited in claim 2 or that the dispersion monitor comprises the elements specifically recited in claim 14, but they do disclose that other methods of dispersion measurement may be used (page 6; paragraph [0085]).

Ihara et al. teach a method and system related to the one disclosed by Danziger et al. including detecting the chromatic dispersion experienced by a signal and controlling a variable dispersion compensator (Figures 1 and 14). Regarding claim 2 in particular, Ihara et al. specifically teach a method of detecting comprising converting an optical signal into an electrical signal (using photodetector 14) and detecting the power of a frequency component in the electrical signal corresponding to the bit rate of the optical signal (using bandpass filter 26 and power detector 28; column 5, lines 23-65).

Similarly, regarding claim 14 in particular, Ihara et al. teach a dispersion monitor comprising a converter (photodetector 14), a bandpass filter 26, and a power sensor (power detector 28; again, see column 5, lines 23-65).

Regarding claims 2 and 14, it would have been obvious to a person of ordinary skill in the art to use the dispersion monitoring method and elements taught by Ihara et al. in the method and system disclosed by Danziger et al. as an engineering design choice of a way to provide the dispersion measurement already disclosed by Danziger et al. The claimed differences exist not as

a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

8. Claims 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. in view of Abbott et al. as applied to claims 7 and 15 respectively above, and further in view of Ihara et al.

Regarding claims 8 and 16, Ishikawa et al. in view of Abbott et al. describe a method and system as discussed above with regard to claims 7 and 15, including steps and means for detecting dispersion. They do not specifically suggest that the detecting comprises the steps specifically recited in claim 2 or that the dispersion monitor comprises the elements specifically recited in claim 14.

However, Ihara et al. teach a method and system related to the one described by Ishikawa et al. in view of Abbott et al. including detecting the chromatic dispersion experienced by a signal and controlling a variable dispersion compensator (Figures 1 and 14). Regarding claim 8 in particular, Ihara et al. specifically teach a method of detecting comprising converting an optical signal into an electrical signal (using photodetector 14) and detecting the power of a frequency component in the electrical signal corresponding to the bit rate of the optical signal (using bandpass filter 26 and power detector 28; column 5, lines 23-65).

Similarly, regarding claim 16 in particular, Ihara et al. teach a dispersion monitor comprising a converter (photodetector 14), a bandpass filter 26, and a power sensor (power detector 28; again, see column 5, lines 23-65).

Regarding claims 8 and 16, it would have been obvious to a person of ordinary skill in the art to use the dispersion monitoring method and elements taught by Ihara et al. in the method

and system described by Ishikawa et al. in view of Abbott et al. as an engineering design choice of a way to provide the dispersion measurement already disclosed by Ishikawa et al. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

9. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. in view of Abbott et al. as applied to claim 15 above, and further in view of Penninckx et al. (US 6,317,240 B1).

Regarding claim 21, Ishikawa et al. in view of Abbott et al. describe a system as discussed above with regard to claim 15, but they do not specifically suggest a polarization mode dispersion compensator.

However, Penninckx et al. teach a system related to the one described by Ishikawa et al. in view of Abbott et al. including a WDM transmission system (Figure 1). They also teach that polarization mode dispersion as well as chromatic dispersion may negatively affect transmitted optical signals such as in the WDM system described by Ishikawa et al. in view of Abbott et al. (Penninckx et al., column 3, lines 20-67). Penninckx et al. further teach a receiving terminal unit comprises a polarization mode dispersion compensator provided for each optical signal (polarization compensator CM in Figure 1 compensates polarization mode dispersion for each WDM signal; column 5, lines 45-55).

It would have been obvious to a person of ordinary skill in the art to further include a polarization mode dispersion compensator as taught by Penninckx et al. in the system described

by Ishikawa et al. in view of Abbott et al. in order to further optimize the optical signals against both types of dispersion and ensure that they are properly received.

Allowable Subject Matter

10. Claims 5, 6, 10-12, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 5, 6, 10-12, 17, and 18, although Danziger et al., Ishikawa et al., and Abbott et al. are all generally directed to providing dispersion compensation (and in the case of Danziger et al. and Abbott et al., dispersion slope compensation) in a WDM system, the prior art does not specifically disclose or suggest the particular combinations of limitations, elements, and/or steps recited by claims 5, 6, 10-12, 17, and 18 (and including any parent claims on which they depend).

Regarding claims 5 and 6 in particular, although the combination of Ishikawa et al. in view of Abbott et al. generally suggests providing a variable dispersion compensator whose chromatic dispersion is controlled and providing a separate dispersion slope compensator, they do not suggest a system or method further including a variable dispersion compensator whose chromatic dispersion and dispersion slope are both controlled at the receiver. Although Danziger et al. generally suggests controlling the dispersion and dispersion slope compensating characteristics of a compensator element, they do not suggest a system or method further providing a variable dispersion compensator whose chromatic dispersion is controlled and providing a separate dispersion slope compensator in a linear repeating unit or at the transmitter.

Regarding claims 10-12 in particular, Ishikawa et al. do not specifically suggest detecting chromatic dispersion in a generating or transmitting step (i.e., at the transmitter or at a linear repeating element) and providing a variable dispersion compensator whose chromatic dispersion is controlled so that the detected chromatic dispersion is reduced as recited in the claims.

Although Danziger et al. do suggest detecting dispersion and providing corresponding compensation in a transmitting step at a repeater (Figure 6), they do not suggest including a separate dispersion slope compensator in the receiving, transmitting, or generating steps as recited.

Regarding claims 17 and 18 in particular, although Danziger et al. disclose a circuit for controlling the dispersion and dispersion slope compensating characteristics of a compensator element and further disclose a monitor for detecting dispersion, they do not specifically disclose a circuit that detects a value of dispersion slope based on the detected chromatic dispersion of at least two optical signals and subsequently controls the variable compensator based on the detected chromatic dispersion and the detected dispersion slope.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 703-605-1186. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christina Y Leung
Christina Y Leung
Patent Examiner
Art Unit 2633